Final Examination
2018/2019 Academic Session

June 2019

JIM105 – Basic Mathematics
(Matematik Asas)

Duration: 3 hours
(Masa: 3 jam)

Please check that this examination paper consists of **SEVEN (7)** pages of printed material before you begin the examination.

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi **TUJUH (7)** muka surat yang bercetak sebelum anda memulakan peperiksaan ini].*

Instructions : Answer **ALL** questions.

*[**Arahan** : Jawab **SEMUA** soalan].*

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah digunapakai].

1.　(a).　Find the following limits.

     (i).　$\lim\limits_{x\to\infty}\dfrac{2x+1}{5x-2}$.

     (ii).　$\lim\limits_{x\to2}\dfrac{x-2}{x^3-8}$.

     (iii).　$\lim\limits_{x\to2}\dfrac{\sqrt{x^2+5}-3}{x^2-2x}$.

     (iv).　$\lim\limits_{x\to0}\dfrac{\sqrt{x+3}-\sqrt{3}}{x}$.

(40 marks)

(b).　Given $f(x)=\dfrac{-2x^2}{x^2-1}$.

     (i).　Determine the vertical and horizontal asymptotes.

     (ii).　Discuss the continuity at $x=1$.

(60 marks)

2.　(a).　Find the derivative for $f(x)=3x^2-6$ using first principles.

(30 marks)

(b).　If $y=xe^{x^2}$, find $\dfrac{dy}{dx}$.

(30 marks)

(c).　Given $y=x^4+4x^3+4x^2-1$. Find all critical numbers and use the second derivative test to determine all local extrema.

(40 marks)

3.   (a).   Find

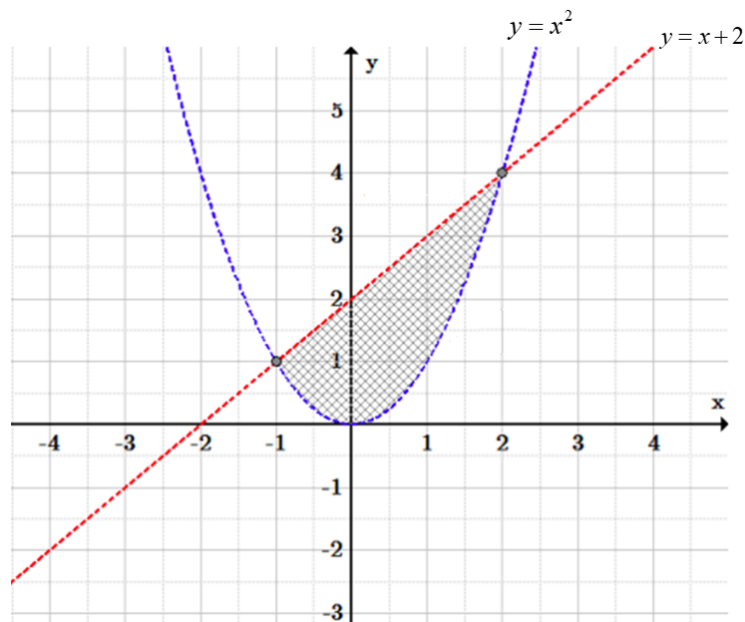(i). $\int x(x-2)^3\, dx$.

(ii). $\int \ln(2x-3)\, dx$.

(iii). $\int \dfrac{1}{x^2+x}\, dx$.

(60 marks)

(b).   Calculate the area of the shaded region:

(40 marks)

...4/-

4. Given $P = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 0 & 1 \\ 3 & -1 & 4 \end{bmatrix}$ and $Q = \begin{bmatrix} 1 & 3 & -1 \\ -1 & 5 & -1 \\ -1 & -1 & 1 \end{bmatrix}$.

(a). Find PQ and deduce P^{-1}.

(40 marks)

(b). Hence, solve the following system of linear equations.

$$2x - y + z = 3$$
$$x + z = 1$$
$$3x - y + 4z = 0$$

(60 marks)

5. (a). The ages of 33 patients who obtained various treatments at a private clinic in a town were recorded as follows.

27	25	19	18	27	29	23	19	41	19	21
26	40	26	20	26	31	25	21	29	27	20
18	23	27	25	20	26	25	35	32	20	21

Find the

(i). mean, median and mode,
(ii). range, first quartile and 70th percentile,
(iii). standard deviation.

(70 marks)

(b). A class has 50 students. Of them, 30 are males and 28 wear spectacles. Of the 30 males, 19 wear spectacles.

(i). If a student of this class is selected at random, find the probability that this student is a male or wears spectacles.

(ii). Are the events "male" and "wear spectacles" independent? Explain.

(30 marks)

1. (a). Cari had yang berikut.

     (i). $\displaystyle \operatorname*{had}_{x\to\infty} \frac{2x+1}{5x-2}$.

     (ii). $\displaystyle \operatorname*{had}_{x\to 2} \frac{x-2}{x^3-8}$.

     (iii). $\displaystyle \operatorname*{had}_{x\to 2} \frac{\sqrt{x^2+5}-3}{x^2-2x}$.

     (iv). $\displaystyle \operatorname*{had}_{x\to 0} \frac{\sqrt{x+3}-\sqrt{3}}{x}$.

(40 markah)

   (b). Diberi $f(x)=\dfrac{-2x^2}{x^2-1}$.

     (i). Tentukan asimptot mencancang dan mengufuk.

     (ii). Bincang keselanjaran pada $x=1$.

(60 markah)

2. (a). Cari pembezaan bagi $f(x)=3x^2-6$ menggunakan prinsip pertama.

(30 markah)

   (b). Jika $y=xe^{x^2}$, cari $\dfrac{dy}{dx}$.

(30 markah)

   (c). Diberi $y=x^4+4x^3+4x^2-1$. Cari semua nombor kritikal dan guna ujian terbitan kedua untuk tentukan semua ekstremum setempat.
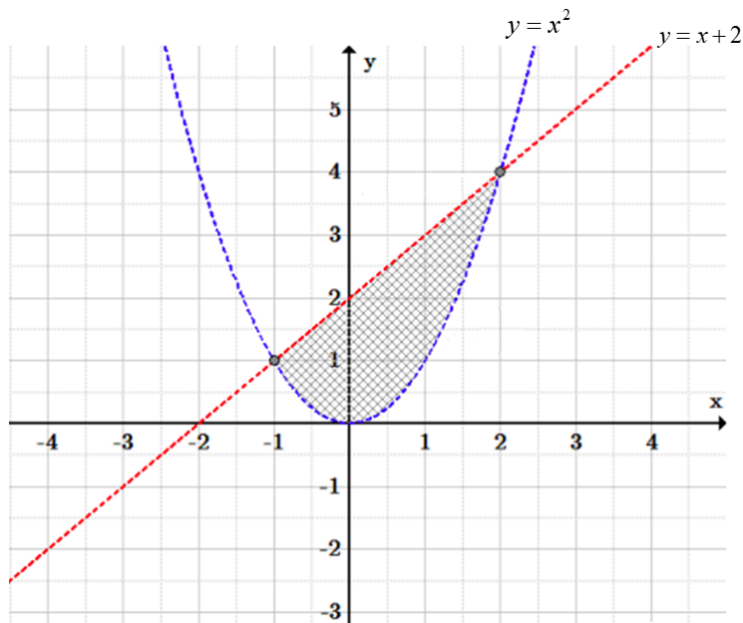
(40 markah)

3.   (a). Cari

   (i). $\int x(x-2)^3\,dx$.

   (ii). $\int \ln(2x-3)\,dx$.

   (iii). $\int \dfrac{1}{x^2+x}\,dx$.

(60 markah)

(b). Kira luas rantau berlorek:

(40 markah)

4.   Diberi $P = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 0 & 1 \\ 3 & -1 & 4 \end{bmatrix}$ dan $Q = \begin{bmatrix} 1 & 3 & -1 \\ -1 & 5 & -1 \\ -1 & -1 & 1 \end{bmatrix}$,

(a). Cari PQ and deduksikan P^{-1}.

(40 markah)

(b). Seterusnya, selesaikan sistem persamaan linear berikut.

$$2x - y + z = 3$$
$$x + z = 1$$
$$3x - y + 4z = 0$$

(60 markah)

5.   (a). Umur 33 orang pesakit yang mendapatkan pelbagai rawatan di sebuah klinik swasta di sebuah bandar dicatatkan seperti berikut.

27	25	19	18	27	29	23	19	41	19	21
26	40	26	20	26	31	25	21	29	27	20
18	23	27	25	20	26	25	35	32	20	21

Cari

(i).   min, median dan mod,

(ii). julat, kuartil pertama dan persentil ke-70,

(iii). sisihan piawai.

(70 markah)

(b). Sebuah kelas mempunyai 50 orang pelajar. Daripada mereka, 30 adalah lelaki dan 28 memakai cermin mata. Daripada 30 lelaki, 19 memakai cermin mata.

(i).   Jika seorang pelajar daripada kelas ini dipilih secara rawak, cari kebarangkalian bahawa pelajar ini adalah lelaki atau memakai cermin mata.

(ii). Adakah peristiwa "lelaki" dan "memakai cermin mata" tak bersandar? Terangkan.

(30 markah)